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A new species of *Calanthe* (*Orchidaceae : Epidendroideae : Arethuseae*) from Mount Kinabalu, Sabah

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Summary. *Calanthe otuhanica* is described from Mt. Kinabalu. It is known from only two populations growing on ultramafic substrate in one locality on the mountain and is probably endemic there. *C. otuhanica* is most closely related to *C. kinabaluensis* which is found at lower elevations on the mountain.

Although Mount Kinabalu is geologically young, its flora is extremely rich, with at least 711 orchid species documented by Wood, Beaman & Beaman (1993). Although the enumeration by Wood *et al.* was comprehensive, recent collections have resulted in the discovery of several new species, including *Dendrobium lamrianum* C.L. Chan, *Dendrochilum pseudoscriptum* T.J. Barkman & J.J. Wood, and *Cymbidium kinabaluensis* K.M. Wong & C.L. Chan. This is particularly surprising as these taxa have been found on the well-collected southern side of the mountain, not far from the main summit trail and the headquarters of Kinabalu Park.

Approximately 13% of the orchid species on Mt. Kinabalu are thought to be endemic (Wood *et. al.* 1993). Many of these are restricted to ultramafic (serpentine) areas although this varies with elevation. A greater proportion of species are endemic on ultramafic areas at the higher elevations. Two examples are *Coelogyne papillosa* Rolfe and *Dendrochilum grandiflorum* (Ridl.) J.J. Sm. These areas have soils that are usually low in silica and high

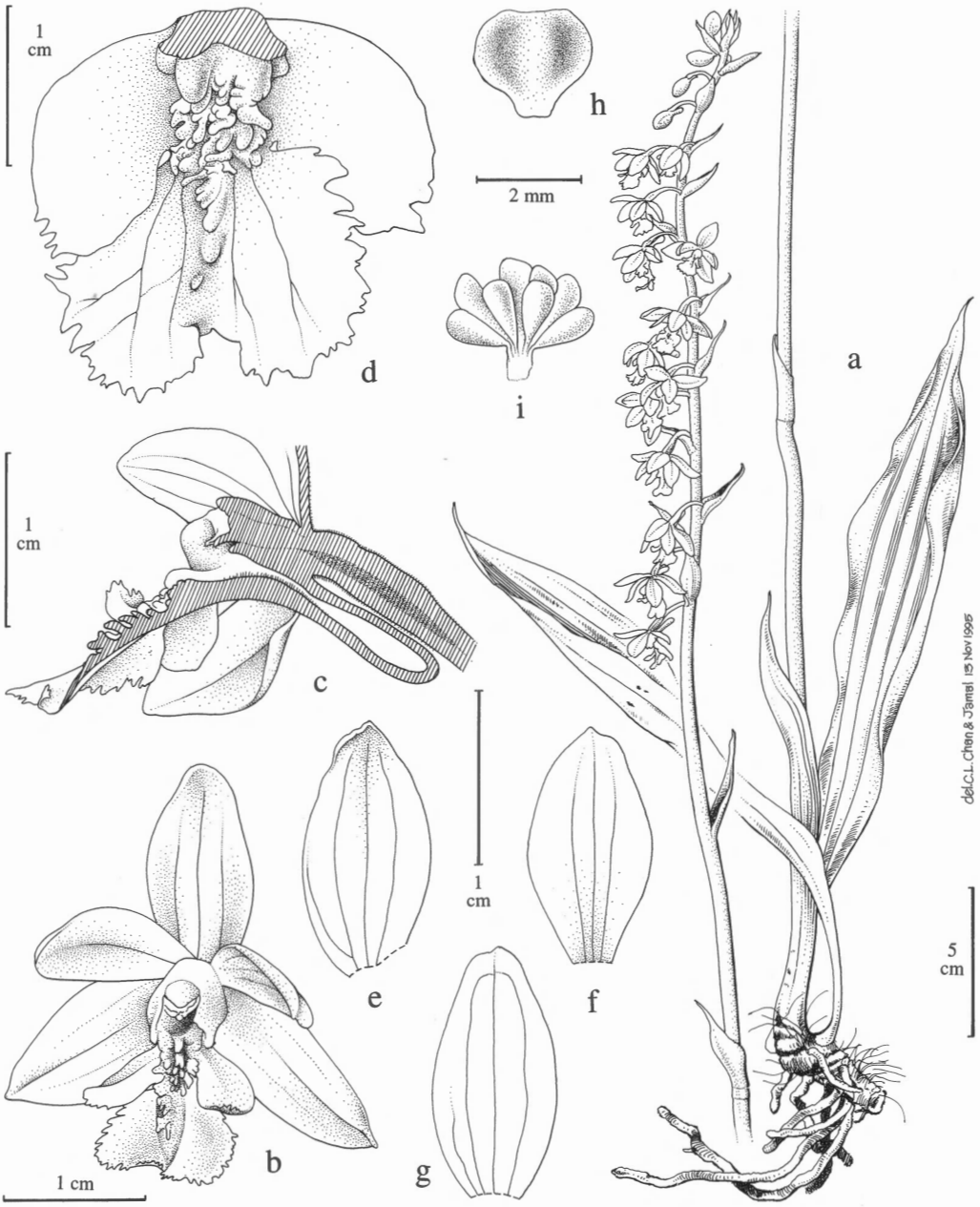

Fig. 1. *Calanthe otuhanica.* **a**, habit. **b**, flower, front view. **c**, flower, longitudinal section. **d**, lip, spread out. **e**, lateral sepal. **f**, petal. **g**, dorsal sepal. **h**, anther cap. **i**, pollinia. All from *Barkman* TJB 27.

in magnesium (Jacobson 1980). Associated with the rocks are high concentrations of minerals that are toxic to plants, such as cobalt, chromium, nickel, and manganese (Brooks 1987). Species not tolerant of such soil conditions may be absent from ultramafic soils although they are abundant on other substrates at similar elevations. Although terrestrial orchids such as species of *Calanthe* may be endemic to the ultramafic sites on Kinabalu, epiphytes such as *Renanthera bella* J.J. Wood previously thought to be an ultramafic endemic are sometimes found on non-ultramafic sites as well (T.J. Barkman, pers. obs.).

The genus *Calanthe* was first described by Robert Brown in 1821. At least 100 species have subsequently been described in this large genus which is distributed throughout the tropical, subtropical, and warm temperate regions of Africa, Asia and the Pacific islands. In addition, a single species is found in tropical America. The genus is in need of a monographic treatment and the total number of species is hard to ascertain. However, recent floristic treatments from Malaysia (including Borneo), Thailand, and Java have reported a total of 57 species. Some of these species, such as *C. sylvatica* (Thouars) Lindl., *C. triplicata* (Willemet) Ames and *C. vestita* Lindl. are widespread throughout these countries while many others e.g. *Calanthe pubescens* from Peninsular Malaysia, are putatively endemic. As was noted by Seidenfaden (1992) and Seidenfaden & Wood (1994), many endemic species are not well known, often represented only by poorly preserved type material, and their correct taxonomic status still requires clarification.

Some 21 species of *Calanthe* are reported from Borneo (Wood & Cribb 1994) with 16 of these occuring on Mt. Kinabalu (Wood *et. al.* 1993). On Kinabalu *Calanthe* occurs at elevations ranging between 600 m and 2700 m, often on ultramafic substrates. Only two species, *C. ovalifolia* Ridl. and *C. tenuis* Ames & C. Schweinf. are endemic, although both are poorly known and have not been recollected since the type collection (Wood *et. al.* 1993). The new species described below is referable to *Calanthe* subgenus *Calanthe* section *Calanthe* as the plants bear leaves when flowering and the floral bracts are persistent. It appears to be restricted to a single high-elevation ultramafic ridge on Kinabalu, with two populations in close proximity. The strongly contrasting white and glossy dark green flowers undoubtedly make it one of the most beautiful species of *Calanthe* on Kinabalu.

Calanthe otuhanica C. L. Chan & T. J. Barkman **sp. nov.** *C. kinabaluensi affinis, sed floribus maioribus albis neque aurantiacis, lobis lateralibus labelli marginibus erosis lobum medianum imbricantibus, callo complexo in lobo mediano labelli extenso, calcari brevi lato postice rotundato atque cavitate stigmatica in depressionem columnae recessa est distinguenda. Typus: Barkman TJB 27, Borneo, Sabah, Mt. Kinabalu, Kinabalu Lipson at c. 2550–2800 m, on well-drained, open steep ultramafic slopes. 15 July, 1994. (Holotypus SAN; isotypi K, SING, the Kinabalu Park Herbarium, Universiti Malaysia Sarawak Herbarium—herbarium and spirit material).* (Figs. 1–3)

Terrestrial or lithophytic herb. Roots elongate, spreading, 2–3 mm in diameter, finely hairy. Pseudobulbs 1.4–1.6 cm long, ovoid, with 3–4 nodes, concealed by sheathing leaf-bases.

Leaves 2.9–5.9 × 14.5–43 cm, subcoriaceous, plicate, glabrous, suberect to arcuate, narrowly elliptic, acuminate; petiole slender at the base, 4.5–18.5 cm long. Inflorescence terminal, erect, racemose, bearing 14–20 well-spaced flowers, 83.5–110 cm long; peduncle up to 34–57 cm long, shortly pubescent; sterile bracts 3–4, 2.9–3.1 mm long; rachis shortly pubescent; floral bracts 11.5–18 mm long, narrowly oblong-linear, acuminate, persistent, dark green. Flowers showy; sepals dark glossy green, petals creamy-white; lip white with a lime green spur, strongly sweetly scented. Pedicel with ovary 2 cm long, very finely pubescent. Dorsal sepal 7 × 15 mm, erect, elliptic, obtuse. Lateral sepals 7 × 15 mm, spreading, elliptic-ovate, acute. Petals 5 × 13 mm, elliptic, obtuse. Lip adnate to the column at the base, 3-lobed in the anterior part, 11 × 11 mm; side lobes 4.5 × 6.5 mm, spreading, linear-elliptic, erose, rounded at the apex; mid-lobe 10 × 7 mm, widening from the base, forming 2 rounded lobes with an erosulate margin; callus complex, with abundant warty ornamentation, basal; spur *c.* 9 mm long, pointing posteriorly, weakly pubescent, clavate, retuse. Column *c.* 6 mm long, footless, fleshy, shortly clavate; pollinia 8, clavate, mealy. Fruits 3.5 × 1.2 cm, shiny green, ellipsoidal, cylindrical in cross section with three ribs, perianth persistant.

OTHER SPECIMENS EXAMINED—BORNEO. SABAH: Mt. Kinabalu, Lipson area, 2700–2900 m, 20 January 1995, *Barkman* TJB 60 (Kinabalu Park Herbarium, SAN).

Fig. 2. Close-up of a single flower of *Calanthe otuhanica.* (Photo: C.L. Chan)

Fig. 3. *Calanthe otuhanica* growing in a steep landslide area at Kinabalu Lipson at 2600 m in Kinabalu Park. (Photo: T.J. Barkman)

The specific epithet is from the word *otuhan,* which means landslide in the language of the Dusun people who live on the lower slopes of Mt. Kinabalu and refers to the unique habitat in which the species is found growing.

Discussion

Calanthe otuhanica appears to be restricted to steep open areas on recent or older stabilized landslides on ultramalfic substrates. Plants grow between boulders and many are often somewhat crushed by newly displaced rocks. Other comparable sites with steep slopes and ultramafic substrate at lower elevations on Mt. Kinabalu do not support this species. It is possible that *C. otuhanica* may be found on nearby Mt. Tambuyukon, which has extensive ultramafic areas and reaches an altitude of 2600 m. *Pholidota sigmatochilus* J.J. Sm. (syn. *Chelonistele kinabaluensis* (Rolfe) de Vogel), which grows alongside *C. otuhanica* on Kinabalu Lipson, has recently been reported from there by the second author (T.J.B.).

C. otuhanica grows in association with the orchids *Coelogyne papillosa, C. rupicola,* and *Platanthera kinabaluensis* Kraenzl. ex Rolfe; *Nepenthes villosa* Hook.f. (Nepenthaceae), the tree *Dacrydium gibbsiae* Stapf (Podocarpaceae) and *Leptospermum recurvum* Hook.f. (Myrtaceae).

Few other species of *Calanthe* occur at comparable elevations on Mt. Kinabalu, although *C. transiens* J.J. Sm. may be found growing at the same site less than 7 m away. It seems possible that these species may be closely related, although *C. transiens* lacks the callus ornamentation found on the labellum, the side lobes do not overlap the mid-lobe and have entire margins, and the spur is long and narrow. The widespread *C. triplicata,* differs in a similar way to *C. transiens,* and also usually found below *c.* 1500 m. In spite of these differences, *C. transiens* and *C. triplicata* are similar to *C. otuhanica* in that the column has a concave, recessed stigma and the labellum is white. The closest relative of *C. otuhanica* from Mt. Kinabalu is *C. kinabaluensis* which has a similarly shaped labellum with lateral lobes twisted such that they are nearly perpendicular to the plane of the mid-lobe and overlap with it; the margins of the lobes are erose, and the callus is complex and extends onto the mid-lobe. In addition, the spur is short and broad and rounded posteriorly in *C. kinabaluensis*. However, that species is only known from elevations below 2100 m, its flowers are orange, smaller, and the stigma is exposed (unlike the recessed stigma in *C. otuhanica*). Simple comparisons may be made between *C. otuhanica* and species found throughout the Malesian region using illustrations or photographs published in the works of Comber (1990), Seidenfaden (1975, 1992), Seidenfaden & Wood (1992) and Wood *et. al.* (1993), Wood & Cribb (1994). None of the species reported from these areas has flowers resembling *C. otuhanica* and, furthermore, there is no similar habitat.

Close relationships between high-elevation endemics on Kinabalu and more widespread

lower-elevation species, such as that proposed for *C. otuhanica* and *C. kinabaluensis*, have been reported for other taxa and may represent a common diversification pattern on the mountain. Lee & Lowry (1980) emphasized the close relationship between *Leptospermum recurvum* Hook.f. (Myrtaceae) and the more widespread *L. flavescens* Sm., and Laubenfels (1988) suggested *Dacrycarpus kinabaluensis* (Wasscher) de Laub. (Podocarpaceae) and *D. imbricatus* (Blume) de Laub. are related but distinct species. Recent unpublished research examining restriction site and DNA sequence variation has suggested a similar pattern of diversification for endemic taxa on Mt. Kinabalu in both *Cyathea* (Cyatheaceae) (D. Conant, pers. comm.) and *Dendrochilum* (Orchidaceae) (T.J. Barkman, unpub. data).

It seems surprising that a species with such conspicuous flowers has not been collected in an area extensively visited by botanists. One possible explanation may be that it only grows in relatively inaccessible sites. Similarly, we can expect that many new species remain to be discovered in the poorly collected areas of Mt. Kinabalu.

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